

## **INDOOR AIR MODELS (1<sup>st</sup> Draft July 26, 2000)**

### **1) Model Acronym/Name/Version:**

Acronym (name)(specify):

Version (specify):

### **2) Overall Simulation and Linkage Capabilities:**

- ☐ Residential indoor air
- ☐ Occupational indoor air
- ☐ Vapor phase pollutants
- ☐ Aerosols (particulates and/or droplets)
- ☐ Pollutants adsorbed to/dissolved in aerosols
- ☐ Single source
- ☐ Multiple source
- ☐ Single zone (room or compartment)
- ☐ Two zones (2 rooms or compartments)
- ☐ Multiple zones (multiple rooms or compartments)
- ☐ Monte Carlo simulation
  - ☐ Internal Monte Carlo software
  - ☐ Links to external Monte Carlo software
  - ☐ Exportable to external Monte Carlo Software
- ☐ Linked internally to a human exposure model, sub-model, or module (specify):
- ☐ Linked externally to a human exposure model, sub-model, or module (specify):
- ☐ Other simulation and/or linkage capabilities (specify):

### **3) Temporal Scale Options for the Overall Simulation:**

- ☐ Minutes
- ☐ Hours
- ☐ Days
- ☐ Weeks
- ☐ Months
- ☐ One year
- ☐ Multiple years
- ☐ Other temporal scale options for the overall simulation (specify):

### **4) Simulated Characteristics of Indoor Product Application/Use:**

- ☐ Single rapid application/use

- 9 Multiple rapid applications/use
- 9 Single prolonged application/use
- 9 Multiple prolonged applications/use
- 9 Spray applications
- 9 Non-spray applications
- 9 Other simulated characteristics of indoor product application/use (specify):

**5) Simulated Temporal Characteristics of Air Emissions:**

- 9 Single pulse
- 9 Multiple pulses
- 9 Continuous
- 9 Intermittent step function with constant release duration and constant intervals between releases
- 9 Intermittent step function with variable release durations and/or variable intervals between releases
- 9 Exponential loading
- 9 Sinusoidal loading
- 9 Diffusion based emission models
- 9 Other simulated temporal characteristics of air emissions (specify):

**6) Simulated Pollutant Emissions to Indoor Air (General - Applicable to Both Residential and Occupational):**

- 9 Intake of polluted outdoor air
- 9 Furnace emissions
  - 9 CO
  - 9 Hydrocarbons
  - 9 Other furnace emissions (specify):
- 9 Emissions during application and post-application from products applied to foundations
  - 9 Termiticides and/or their carriers
  - 9 Other insecticides and/or their carriers
  - 9 Water proofing coatings and chemicals
  - 9 Other simulated emissions from products applied to foundations (specify):
- 9 Emissions from water use within the building
  - 9 VOCs
  - 9 Volatiles containing sulfur
  - 9 Other simulated emissions from water use (specify):
- 9 Emissions from permanent or semi-permanent matrices within the building that are not the result of product applications within the building after completion
  - 9 Building materials
  - 9 Furniture
  - 9 Floor coverings

- 9 Window coverings
- 9 Other simulated emissions from permanent or semi-permanent matrices (specify):
- 9 Emissions from stored products
  - 9 Solvents
  - 9 Paint
  - 9 Other types of coating
  - 9 Fuel
  - 9 Other simulated emissions from stored products (specify):
- 9 Radon from geological formations surrounding the foundation or basement

**7) Simulated Pollutant Emissions to Indoor Air (Residential)**

- 9 Emissions during application and post-application from residential products applied within the house to humans or pets
  - 9 Generic
  - 9 Cosmetics
  - 9 Deodorants
  - 9 Flea/tick insecticides
  - 9 Hair products
  - 9 Insect repellants
  - 9 Medicinal
  - 9 Other simulated residential emissions from products applied to humans or pets (specify):
- 9 Emissions during application/use and post-application from residential products applied within the house to inanimate objects.
  - 9 Generic
  - 9 Aerosol paint
  - 9 Carpet cleaner
  - 9 Clear coatings
  - 9 Fabric protection
  - 9 Floor wax
  - 9 Insecticides
  - 9 Latex paint
  - 9 Laundry detergents
  - 9 Liquid cleaners
  - 9 Liquid fabric softener
  - 9 Oil based paint
  - 9 Solid air fresheners
  - 9 Vinyl upholstery cleaners
  - 9 Other simulated residential emissions from products applied to inanimate objects (specify):

## **8) Simulated Pollutant Emissions to Indoor Air (Occupational)**

- 9 Adhesives manufacturing
- 9 Adhesive uses
- 9 Bioprocessing
- 9 CFC substitute manufacturing
- 9 Conventional coating manufacturing
- 9 Conventional coating applications
- 9 Detergent manufacturing
- 9 Dye and ink manufacturing
- 9 Electronic component manufacturing
- 9 Fragrance manufacturing
- 9 Leather dyeing
- 9 Leather tanning
- 9 Lube oil additive manufacturing
- 9 Metal electroplating
- 9 Metal cleaning and degreasing
- 9 Ore smelting
- 9 Paper dyeing
- 9 Paper manufacturing
- 9 Plastic manufacturing
- 9 Petroleum refining
- 9 Photo development
- 9 Photo film manufacturing
- 9 Polyurethane foam application/blowing
- 9 Powder coating manufacturing
- 9 Powder coating applications
- 9 Printing ink use
- 9 Radiation curable coating manufacturing
- 9 Radiation curable coating applications
- 9 Rubber manufacturing
- 9 Steel manufacturing
- 9 Spray coating
- 9 Synthetic fiber manufacturing
- 9 Textile finishing
- 9 Textile dyeing
- 9 Toner use
- 9 Water treatment additive uses

- 9 Wood lumber manufacturing
- 9 Wood preservative manufacturing
- 9 Wood preservative applications
- 9 Other simulated occupational emissions to indoor air (specify):

#### **9) Simulated Transport Processes for Pollutants in Indoor Air:**

- 9 Interzonal transport
- 9 Transport in/out of the building as a function of building ventilation
- 9 Advection of vaporized pollutants in air
- 9 Advection of aerosols in air
- 9 Dispersion of vaporized pollutants in air
- 9 Dispersion of aerosols in air
- 9 Diffusion of pollutants out of liquid or solid matrices
- 9 Sinks due to adsorption of pollutants to solid matrices
  - 9 Assumed linear equilibrium adsorption/desorption
  - 9 Assumed non-linear equilibrium adsorption/desorption
  - 9 Adsorption/desorption kinetics
- 9 Coagulation of aerosols
- 9 Deposition of aerosols
- 9 Other simulated transport processes for pollutants in indoor air (specify):

#### **10) Simulated Fate Processes for Indoor Toxic Pollutants:**

- 9 Not applicable
- 9 In liquid or in solid matrices
  - 9 Hydrolysis
- 9 In air
  - 9 Hydrolysis
  - 9 Direct photolysis in air
- 9 Reaction rate constants can be adjusted for changes in temperature
- 9 Rates of formation and decline of daughter products
- 9 Other simulated fate processes for indoor toxic pollutants (specify):

#### **11) Temporal and Spatial Assumptions for Pollutant Transport in Indoor Air:**

- 9 Steady state, zero dimensional transport (completely mixed box model for each zone) with  $C =$  constant for each zone
- 9 Steady state, one dimensional transport with  $C = f(z)$  for each zone
- 9 Transient, zero dimensional transport (completely mixed box model for each zone) with  $C = f(t)$  for

each zone

9 Transient, one dimensional transport with  $C = f(t,z)$  for each zone

9 Other temporal and spatial assumptions for pollutant transport in indoor air (specify):

## **12) Governing Equations and Solutions for Indoor Air Pollutants:**

9 One pollutant mass balance ordinary differential equation (for a single zone box model of the pollutant in air) and its solution with the specified initial condition

9 Two or more pollutant mass balance ordinary differential equations (for a multiple zone box model - one for each zone simulated - of the pollutant in air) and their coupled solutions with the specified initial conditions

9 One pollutant mass balance partial differential equation (for a single zone one dimensional transport model of the pollutant in air) and its solution with the specified initial and boundary conditions

9 Two or more pollutant mass balance partial differential equations (for a multiple zone one dimension transport model - one for each zone simulated - of the pollutant in air) and their coupled solutions with the specified initial and boundary conditions

9 Two or more pollutant mass balance partial differential equations (for the pollutant in solid and/or liquid media to estimate pollutant emissions to the air) and their solutions with the specified initial and boundary conditions

9 Analytical solutions

9 Numerical solutions

9 Other governing equations/solutions for indoor air pollutants (specify):

## **13) Temporal Resolution Options for the Output:**

9 Minutely

9 Hourly

9 Daily

9 Weekly

9 Monthly

9 Annual

9 Other temporal resolution options for the output (specify):

## **14) Most Sensitive Input Variables:**

List the most sensitive input variables, their definitions, their maximum spatial and temporal dimensions, and whether they can be entered as input distributions (specify):

## **15) Output Variables:**

List the output variables, their definitions, their maximum spatial and temporal dimensions, and whether

they can be displayed as output distributions (specify):